भारतीय मानक

IS 15475 (Part 1) : 2022

Indian Standard

मनोरंजन के लिए सुरक्षित सवारी की संस्तुत रीति संहिता

भाग 1 सामान्य सूचना

(पहला पुनरीक्षण)

Code of Recommended Practice for Amusement Rides Safety

Part 1 General Information

(First Revision)

ICS 97.200.40

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भारतीय मानक ब्यूरो
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September 2022 **Price Group 7**

Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways and Related Equipment Sectional Committee, MED 6

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

Amusement parks in India are becoming quite common and people visit these parks quite often. In order to ensure their safety in amusement parks or while enjoying the rides, an attempt has been made to stipulate safety in the form of a National Code. It is hoped that organizers of amusement parks, manufacturers of rides would make use of these codes to ensure the overall safety of human beings and equipment at such places.

This revision has been taken up to keep pace with the latest technological developments and international practices. This revision incorporates the following major changes:

a) More definitions were added under clause **3**.

The code of recommended practice for amusement rides safety is in six parts. This standard covers the general information. Other parts in this series under the general title are as follows:

Part 2 Safety requirements

Part 3 Design, manufacture, and erection

Part 4 Selection, training, and supervision of operators

Part 5 Operation and maintenance procedures

Part 6 Performance tests

The composition of the committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values’ (second *revision*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CODE OF RECOMMENDED PRACTICE FOR AMUSEMENT RIDES SAFETY

PART 1 GENERAL INFORMATION

(*First Revision*)

1 SCOPE

This standard (Part 1) covers general information regarding the recommended practice to be adopted in the safe use of amusement rides and devices.

Amusement rides and devices covered in this standard may be temporary including inflatables or permanent nature.

This standard is not intended to contravene the provision of any of the existing Government regulations. It is the responsibility of the user of this code to establish appropriate safety and health practices and comply with regulatory and statutory requirements prior to the use of the ride or device for carrying passengers for their amusement.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1641 : 2013	Fire safety of buildings (General) — General principles of fire grading and classification — Code of practice (*second revision*)
1642 : 2013	Fire safety of buildings (General) — Details of construction — Code of practice (*second revision*)
1644 : 2013	Fire safety of buildings (General) — Exit requirements and personal hazard — Code of practice (*second revision*)
1646 : 2015	Fire safety of buildings (General) — Electrical installations — Code of practice (*third revision*)
3646 (Part 1) : 1992	Code of practice for interior illumination — Part 1 General requirements and recom —mendations for working interior (*first revision*)
15475 (Part 5) : 2022	Code of recommended practice for amusement rides safety — Part 5 Operation and maintenance procedures

3 TERMINOLOGY

3.1 For the purpose of this standard, the following definitions shall apply.

3.1.1 *Amusement/Joy Park* — A particular site provided or allotted or procured for the purpose of entertainment and amusement where one or more rides are temporarily or permanently installed for the riders/visitors.

3.1.2 *Amusement Ride or Amusement Device* — A device or combination of devices or elements that carry, convey or direct a person(s) over or through a fixed or restricted course or within a defined area for the primary purpose of amusement or entertainment.

3.1.3 *Attendant* — A person working under the supervision of an operator, not authorized to operate the ride but in case of emergency should be competent enough to stop/evacuate the ride.

3.1.4 *Carnival* — An enterprise or group of enterprises involved in making arrangements for entertainment or amusement to the public by means of portable amusement rides, devices, or temporary structures in any number of combinations that are seasonally organized on a particular location or site.

3.1.5 *Circular Ride* — An amusement ride whose motion is priority rotary in a fixed or variable plane from horizontal to 45 degree inclination.

3.1.6 *Fence* — A type of barrier consisting of (but not limited to) posts, boards, wire, stakes, or rails, that is, used to restrict the entry of authorized persons from coming into contact with a restricted portion or moving portion of the ride and also to check the access to certain restricted areas.

3.1.7 *Flat Ride* — An amusement ride that operates on a single level over a controlled, fixed course or track or confined to a limited area of operation.

3.1.8 *High Ride* — An amusement ride whose motion is in a fixed or variable plane from horizontal to vertical.

3.1.9 *Kiddie Ride* — An amusement ride designed primarily for use by children up to 12 years of age and/or a person or child below the height of 140 cm.

3.1.10 *Major Modification* — Any change in either the structural or operational characteristics of the ride, which will alter its performance from that specified in the manufacturer's design criteria.

3.1.11 *Minor Modification* — Any change that does not alter the structural and operational characteristics of the ride or device nor change its performance from that specified in the manufacturer's design criteria.

3.1.12 *Park Operator* — Individual, group of persons, association, agency, or company duly registered and recognized by Indian Association of Amusement Parks and Industries having a valid license from the relevant regulating/statutory authority for making arrangements for entertainment amusement of person(s) by providing, erecting and commissioning one or more amusement ride or devices free of charge or on chargeable basis.

3.1.13 *Rider* — A person permitted by the owner to enjoy a ride within a defined zone and particular time limit.

3.1.14 *Ride Manufacturer* — A person, group of persons, agency, or company registered with appropriate authority and having a valid license for designing, fabricating, assembly, and procuring various parts equipment, structures, devices that constitute a ride for carrying, conveying riders/visitors for entertainment and amusement.

3.1.15 *Ride Operator* — A person or an agent of an amusement park or carnival directly involved to operate, control, maneuver, monitor, maintain the electrical/mechanical hydraulic/pneumatic/ gravitational system of an amusement ride or device duly authorized by the owner, park operator and trained through a recognized authority or agency.

3.1.16 *Ride Supplier* — A person or group of persons or agency or company involved in trading and supply of parts, equipment structure, attachments, accessories, and devices that constitute a ride used for amusement and entertainment purposes.

3.1.17 *Unscheduled Cessation* — A rare, unusual, or irregular stopping of an amusement ride operation, intentional or otherwise, that is, considered abnormal or potentially hazardous in nature or both due to its cause, method, or result.

3.1.18 *Controller* — Person/persons having overall control of the ride operation

3.1.19 *Regulating/Statutory Authority* — Any Local / State / National Authority legally authorized to issue a permit for operation of a ride for public use.

3.1.20 *Inspection Authority* — Any Government/(Government authorized – Semi Govt / Private) organization operating in accordance with BIS codes for approval, examination, and relevant tests.

3.1.21 *Permit* — Authorisation to operate a ride for public use granted by any Local Regulating/ Statutory authority

3.1.22 *Locking* — A ride is held secure against opening except by intentional action of the operator not accessible by the passenger.

3.1.23 *Safety Factor* — The ratio of the ultimate breaking load of a component against the maximum allowable load which may be imposed on that component.

3.1.24 *Critical Component* — These are the components whose failure will result in uncontrolled operation or movement of the ride where there is a risk of failure leading to fatality or injury.

3.1.25 *Amusement Industry* — The collective term for the fairgrounds and amusement parks industry. It includes the people who design, manufacture, supply, control, operate, attend, maintain and carry out inspection of articles of fairground equipment and other attractions at fairgrounds and amusement parks.

3.1.26 *Appointed Inspection Body (AIB)* — The registered Inspection Body (IB) that has overall control of the in-service annual inspection of an amusement device and the responsibility for issuing the Declaration of Operational Compliance (DOC). The IB also has the overall responsibility for confirming that pre-use inspections have been completed and for issuing the DOC.

3.1.27 *Assessment of Conformity to Design (ACD)* — The procedures and investigations necessary to confirm that a piece of equipment or a part of it has been manufactured in conformity with a particular reviewed design specification. (*see also* design review)

3.1.28 *Commissioning Tests* — Tests designed to compare the performance of a new or modified piece of equipment against its specification.

3.1.29 *Daily Check* — An operational check carried out before an attraction is made available to the public, to determine whether or not an amusement device is in such a condition that it may continue to be operated safely. The controller or a person nominated by the controller should conduct it. The check should identify any defects and indicate what replacement, repair, or adjustment is needed before the attraction can be used. For an amusement device, it should also include a trial run with a functional check of any safety-related systems to make sure that they are properly adjusted and work in accordance with the operations manual.

3.1.30 *Declaration of Operational Compliance (DOC)* — The safety certificate issued by an IB (Inspection Body) after the satisfactory completion of all the relevant pre-use and in-service annual inspections on an amusement device. It is used to certify that the device is safe to operate for a period of no longer than 12 months, or less if specified by the IB.

3.1.31 *Functional Test* — A test or combination of tests designed to investigate whether an amusement device continues to carry out its safety-critical functions. The tests may need to include measures of both function and performance using conditions and loading appropriate to those likely to occur in use.

3.1.32 *Hazardous Projectiles* — Mechanically-fired projectiles which could cause personal injury, including live ammunition; other metal projectiles designed to be fired by compressed air, example pellets, darts, and balls; crossbow bolts; and any targets which are projectiles, for example clays. It does not include hand-thrown projectiles.

3.1.33 *Initial Test* — Tests required to confirm that a newly constructed, imported, or modified amusement device operates in accordance with a specification that has been the subject of a successful independent design review. Commissioning tests are not a substitute for an initial test, but an IB may take account of relevant data from such tests as evidence of the performance of a device under particular conditions as part of the overall initial test.

3.1.34 *In-Service Annual Inspection* — The procedures, tests, and investigations necessary for an AIB to decide whether an amusement device may continue to be operated safely, or that it requires defects to be remedied either immediately or in a specified time before the device may be operated over a specified period of time.

3.1.35 *Operations Manual* — Full instructions for safe use compiled by the designer, manufacturer, importer, or supplier (updated by the user) and containing documentary proof of all inspection reports and records of any modifications and repairs, as well as other records previously kept in the logbook. Records of daily checks should be kept in the operations manual.

3.1.36 Passenger *Containment System* — A system comprising one or more components, example seating, footwells, handrails, and passenger restraints designed to prevent passengers from moving outside a predefined area on a ride.

3.1.37 *Trial Run* — Proving run of an amusement device during which, no passengers are carried out.

4 MATERIALS

Unless otherwise specified all materials used in the construction and operation of amusement rides, devices, and their supporting structures shall comply with the relevant India Standards where available. A list of such Indian Standards for guidance is given in Annex A. Materials equivalent to or superior to those specified may be used subject to agreement between the manufacturer and the user.

5 GENERAL INFORMATION

5.1 Information related to the safety requirements of the amusement rides of various types may be divided into three stages as follows:

a) Construction stage (design and manufacture);
b) Installation stage (layout, erection, and entry into service); and

c) Utilization stage (operation and maintenance).

5.1.1 The safety requirements during the construction stage shall be those to be taken care of during the design and manufacture of the amusement ride system, equipment, and machinery.

5.1.2 The safety requirements during installation shall be those to be taken care of during layout, erection, and entry into service of the amusement ride system, equipment, and machinery.

5.1.3 The safety requirements during the utilization stage shall be those to be taken care of during the operation and maintenance of the amusement ride system, equipment, and machinery. Operational and maintenance procedures and responsibilities of manufacturer/seller and operator/user are covered in IS 15475 (Part 5).

5.1.3.1 One of the most important aspects during the utilization stage is that in the event of any accident/injury/fatality of anybody, all relevant information for immediate mitigation is readily available near the ride or site office.

5.2 Lighting

Suitable lighting for the ride system, equipment, and machinery shall be provided. For guidance IS 3646 (Part 1) may be referred.

5.2.1 Permanent lighting shall be installed in tunnels and pits with a switch located convenient to the entrance(s).

5.2.2 Electric outlets for hand lamps shall be provided at convenient locations.

5.2.3 The lamps/lights shall be cleaned regularly.

5.3 Fire Protection

Fire protection facilities shall be provided and shall be to the approval of the statutory authority. For guidance IS 1641, IS 1642, IS 1644, and IS 1646 may be referred.

6 INFORMATION TO BE PROVIDED BY THE MANUFACTURER/SELLER AT THE TIME OF SALE

6.1 The manufacturer/seller of an amusement ride or device shall provide the minimum information necessary for proper identification, placement, erection, and operation of the ride or device. Documented instructions shall be furnished for safe operation and maintenance.

6.2 Information Plate

Information plate shall be permanently affixed on each ride or device at a visible location. The following information shall remain legible for the expected life of the ride or device:

a) Ride name and manufacturer
b) Ride serial number;
c) Ride model number;
d) Date of manufacture;
e) Ride speed — Maximum and minimum revolutions per minute;
f) The direction of travel — When the proper direction of travel is essential to the design operation of the ride. The direction of travel shall be designated including its reference point;
g) Passenger capacity by weight — Maximum total passenger weight per passenger position and per ride or device; Maximum carrying capacity in terms of Adult & Child passengers (Child age can be between 5-12 years and height should be between 3 feet to 4 feet)
h) Passenger capacity by number — Maximum total number of adult or child passengers per passenger position and per ride or device;
j) Passenger evacuation process after a stop function or fault which results in equipment's orientation that prevents safe passenger evacuation;
k) Operational speed.

NOTE — Minimum eight/minimum number of persons shall be indicated for the operation of the ride, where applicable.

6.3 Instructions

Documented instructions for erection, operation, and maintenance shall include the following:

6.3.1 *Ride Duration*

The maximum time permitted for the ride to be in operation per element of the ride function for amusement purposes or maximum exposure time for a passenger (time restrictions).

6.3.2 *Recommended Balance of Passenger Loading or Unloading*

When passenger distribution is essential for the proper operation of the ride or device, the appropriate loading and unloading procedure, with respect to weight distribution shall be described.

6.4 Electrical Power Requirements

The total electrical power required for the safe operation of the ride or device shall be declared in watts and volts including minimum and maximum voltage limits.

6.5 General Operating Conditions

Altitude, type of drive and its specification, ambient temperature

6.6 Water Flow

Minimum/maximum water flow rates.

6.7 Static Information

Height, width, diameter, and weight of ride or device in a static state (non-operational state).

6.8 Dynamic Information

Height, width, diameter, and weight, when ride or device is in operation (Dynamic state).

6.9 Recommended Passenger Restrictions

Where applicable, any recommended passenger limitation such as height, weight, placement, etc.

6.10 Environmental Restrictions

Recommendations for operational restrictions relating to environmental conditions, such as wind, rain, salt corrosion.

Wind speed can be guided by a centrally located “Anemometer” and its implied restrictions.

6.11 Fastener Schedule

Schedule/manual for the correct grade, torque, and placement of all fasteners used in the assembly or erection of ride or device.

6.12 Load Distribution per Footing

Maximum static loading and maximum dynamic loading of each footing of ride or device.

6.13 Elements and Structures

Description of all structural interfaces between ride/device and supports including necessary data related to erection, installation, and operation of ride or device. Information shall also include the following:

a) Maximum static design loads of each footing or equivalent structural connection;
b) Maximum dynamic design loads of each footing or equivalent structural connection;
c) Any other structural interface design specification.

6.14 Transportation

Information necessary for the transport of a portable ride or device such as height, width, length, and weight shall be provided.

ANNEX A

(*Clause* 4)

INDIAN STANDARD SPECIFICATIONS ON MATERIALS

A-1 STRUCTURAL STEEL

IS No.	*Title*
808 : 2021	Hot rolled steel beam column channel and angle sections —Dimensions and properties
811 : 1987	Specification for cold formed light gauge structural steel sections (*second revision*)
1161 : 2014	Steel tubes for structural purposes —Specification (*fifth revision*)
1239 (Part 1) : 2004	Steel tubes, tubulars and other wrought steel fittings —Specification — Part 1 steel tubes (*sixth revision*)
1239 (Part 2) : 2011	Steel tubes, tubulars and other steel fittings — Specification — Part 2 steel pipe fittings (*fifth revision*)
1252 : 1991	Hot rolled steel bulb angles dimensions (*first revision*)
2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)
3039 : 1988	Specification for structural steel for construction of hulls of ships (*second revision*)
3443 : 1980	Specification for crane rail sections (*first revision*)
3601 : 2006	Steel tubes for mechanical and general engineering purposes — Specification (*second revision*)
3954 : 1991	Hot rolled steel channel sections for general engineering purposes — Dimensions
4923 : 2017	Hollow steel sections for structural use — Specification (*third revision*)
2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)

A-2 FORGINGS AND CASTINGS

IS No.	*Title*
210 : 2009	Grey iron castings — Specification (*first revision*)
1030 : 1998	Carbon steel castings for general engineering purposes — Specification (*fifth revision*)
1865 : 1991	Iron castings with spheroidal or nodular graphite — Specification (*third revision*)
2004 : 1991	Carbon steel forgings for general engineering purposes — Specification (*third revision*)
4367 : 1991	Alloy steel forgings for general industrial use — Specification (*first revision*)

IS No.	*Title*
4771 : 1985	Specification for abrasion — Resistant iron castings (*second revision*)
4896 : 1992	One percent chromium steel castings for resistance to abrasion — Specification (*second revision*)
14329 : 1995	Malleable iron castings — Specification

A-3 RIVETS

IS No.	*Title*
1929 : 1982	Specification for hot forged steel rivets for hot closing (12 to 36 mm diameter) (*first revision*)
2998 : 1982	Specification for cold forged steel rivets for cold closing (1 to 16 mm diameter) (*first revision*)

A-4 BOLTS

IS / ISO No.	*Title*
IS 1363 (Part 1) : 2019 ISO 4016 : 2011	Hexagon head bolts, screws and nuts of product grade ‘C’ — Part 1 Hexagon head bolts (Size range M 5 to M 64) (*fifth revision*)
IS 1363 (Part 2) : 2018 ISO 4018:2011	Hexagon head bolts, screws and nuts of product grade ‘C’ — Part 2 Hexagon head screws (Size range M 5 to M 64) (*fifth revision*)
IS 1363 (Part 3) : 2018 ISO 4034 : 2012	Hexagon head bolts, screws and nuts of product grade ‘C’ — Part 3 (Style 1) hexagon nuts (Size range M 5 to M 64) (*fifth revision*)
IS 1364 (Part 1) : 2018 ISO 4014 : 2011	Hexagon head bolts, screws and nuts of product grades A and B — Part 1 hexagon head bolts (Size range M 1.6 to M 64) (*fifth revision*)
IS 1364 (Part 2) : 2018 ISO 4017	Hexagon head bolts, screws and nuts of product grades A and B — Part 2 Hexagon head screws (Size range M 1.6 to M 64) (*fifth revision*)
2585 : 2006	Square head bolts, screws and square nuts of product grade ‘C’ — Specification (*second revision*)

A-5 CONVEYOR BELTS

IS No.	*Title*
1891 (Part 1) : 2021	Conveyor and elevator textile belting — Specification — Part 1 General purpose belting (*fifth revision*)

IS No.	*Title*
1891 (Part 2) : 1993	Conveyor and elevator textile belting — Specificaton — Part 2 Heat resistant belting (*third revision*)
1891 (Part 3) : 1988	Specification for rubber conveyor and elevator textile belting — Part 3 Oil resistant belting (*second revision*)
1891 (Part 4) : 1978	Specification for rubber conveyor and elevator belting — Part 4 Hygienic belting (*first revision*)

A-6 CHAIN

IS / ISO No.	*Title*
IS 2403 : 2014 ISO 606	Short — Pitch transmission precision roller and bush chains, attachments and associated chain sprockets (*third revision*)
3542 : 1980	Specification for extended pitch transmission precision roller chains and chain wheel (*first revision*)
3560 : 1980	Specification for short pitch transmission precision bush chains and chain wheels (*first revision*)
3948 : 1986	Specification for calibrated high tensile steel (round link) chain (electric butt welded) for chain conveyors and coal ploughs used in mines
6834 (Part 1) : 1973	Specification for conveyor chains, chain — Wheels and attachments — Part 1 Chains
6834 (Part 2) : 1976	Specification for conveyor chains, chain —Wheels and attachments — Part 2 Chain — wheels
6834 (Part 3) : 1976	Specification for conveyor chains, chain —Wheels and attachments — Part 3 Attachments

A-7 GEARS

IS / ISO No.	*Title*
IS 2535 (Part 1) : 2004 ISO 53	Cylindrical gears for general and heavy engineering — Part 1 Standard basic rack tooth profile (*third revision*)
IS 2535 (Part 2) : 2004 ISO 54	Cylindrical gears for general and heavy engineering — Part 2 Module (*third revision*)
3734 : 1983	Dimensions for worm gearing (*first revision*)
IS 5037 (Part 1) : 2004 ISO 677	Straight bevel gears for general engineering and heavy engineering — Part 1 Basic rack (*first revision*)

IS / ISO No.	*Title*
IS 5037 (Part 2) : 2004 ISO 678	Straight bevel gears for general engineering and heavy engineering — Part 2 Module and diametral pitches (*first revision*)

A-8 WIRE ROPES

IS No.	*Title*
1856 : 2021	Steel wire ropes for haulage purposes — Specification (*fourth revision*)
2266 : 2019	Steel wire ropes for general engineering purpose — Specification (*fifth revision*)

A-9 CONCRETE

IS No.	*Title*
456 : 2000	Plain and reinforced concrete — Code of practice (*fourth revision*)

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways and Related Equipment Sectional Committee, MED 06

Organization(s)	*Representative(s)*
RITES Limited, Gurugram	Shri Sandeep Mehra (***Chairman***)
CSIR — Central Institute for Mining and Fuel Research, Dhanbad	Shri Debashish Basak
	Shri Girendra M. Prasad (*Alternate*)
Conveyor and Ropeway Services Private Limited, Kolkata	Shri S. Shekhar Chkravarty
	Shri Kamal Kumar Bose (*Alternate*)
Desein Private Limited, New Delhi	Shri H. K. Gupta
	Shri Arvinder Singh (*Alternate*)
Directorate General Factory Advice Service and Labour Institutes, Mumbai	Shri G. P. Nijalingappa
	Shri H M Bhandari (*Alternate*)
Directorate General of Mines Safety, Dhanba	Shri D. B. Nayak
	Shri Vijay Yadaorao Barapatre (*Alternate*)
Durgapur Steel Plant, Sail Durgapur	Shri Sanjay Kumar
	Shri Deepak Biswal (*Alternate*)
Elecon Engineering Company Limited, Gujarat	Shri C S Shah
	Shri. K.S. Kodia (*Alternate*)
Indian Association of Amusement Parks and Industries, Mumbai	Shri Pradeep Sharma
	Shri Anil Padwal (*Alternate*)
Lepton Projects Private Limited, Ghaziabad	Shri Sanjay Kumar
	Shri Piyush Rathi (*Alternate*)
MECON Limited, Ranchi	Shri Sanjoy Bhattachar
	Shri Amit Pal (*Alternate*)
Mcnally Bharat Engineering Company Limited, Kolkata	Shri Sanjoy Maiti
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Ministry of Ports, Shipping and Waterways, New Delhi	Shri Anil Pruthi
	Shri Ramji Singh (*Alternate*)
NTPC Limited, New Delhi	Shri O. P. Kalia
National Mineral Development Corporation, Hyderabad	Shri Alok Kumar Mehta
	Shri S. Surender (*Alternate*)

Organization(s)	*Representative(s)*
Phoenix Conveyor Belt India Private Limited, Kolkata	SHRI RAJEEV SHARMA SHRI ASOKE KUM. GHOSH (*Alternate*)
Polo Amusement Park Lmited, Gurugram	SHRI SANTOSH CHAWLA
Project and Development India Limited, Noida	SHRI NARENDRA SINGH
RITES Limited, Gurugram	SHRI DINESH KUMAR
Ropeway and Resorts Private Limited, Kolkata	SHRI A.K. KINRA
TRF Limited (A Tata Enterprise), Jamshedpur	SHRI N. K. SINGH SHRI SUBHASH SHARMA (*Alternate*)
Tata Consulting Engineers Limited, Navi Mumbai	SHRI SUJOY MAITI SHRI SHIREESH S. SWAMI (*Alternate*)
Usha Breco Limited, Ghaziabad	SHRI MANOJ PANWAR SHRI SANJEEV DHARIWAL (*Alternate*)
Usha Martin Limited, Ranchi	SHRI SUBRATA DUTTA SHRI SANDEEP JAISWAL (*Alternate*)
In personal capacity (*145/4A, South Sinthi Road, Kolkata – 700050*)	SHRI C. K. KARMAKAR
In personal capacity (*BH/V1/SF,VIP Floors Sector 81, DPS Faridabad, Haryana - 121007*)	SHRI ASHUTOSH BHADRA
In personal capacity (*F-7B DDA MIG Flats, Hari Nagar, New Delhi - 110006*)	SHRI S. C. GANDHI
In personal capacity (*20 D, Dhakuria Station Road, Kolkata - 700031*)	SHRI RANJAN MUKHERJEE
BIS Directorate General	SHRI RAJNEESH KHOSLA, SCIENTIST 'E' AND HEAD (MED) [REPRESENTING DIRECTOR GENERAL (*Ex-Officio*)]

Member Secretary
SHRI AMAN DHANAWAT
Scientist 'B' (MED), BIS

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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